

Kuiper Systems LLC
Application for Special Temporary Authority
Narrative Statement

Pursuant to Sections 5.51, 5.54(a)(2), and 5.61 of the rules¹ of the Federal Communications Commission (“Commission”), Kuiper Systems LLC, a wholly owned subsidiary of Amazon.com Services LLC (“Amazon.com” or “Amazon”), hereby respectfully requests special temporary authority for an experimental license to operate in the 17.8-19.305, 19.374-19.4, 19.5-20.0 GHz, 27.5-27.505, 28.5-29.0 and 29.5-30.0 GHz band segments for a period of six months to conduct testing of prototype antennas and developmental RF circuits. In support of its request, Amazon provides the following additional information required by Section 5.61:

(1) Name, address, phone number (also email address and facsimile number, if available) of the applicant.

*Amazon Stop Buzzer
Contact*

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(2) Explanation of why an STA is needed.

Amazon seeks special temporary authority to commence testing to evaluate the design and performance of prototype antennas for earth stations, spacecraft and customer terminals in Amazon labs during development. Amazon seeks to begin testing as soon as possible, August 26, 2021.

Amazon is preparing to deliver high-capacity, low-latency broadband communications services to tens of millions of unserved and underserved consumers and businesses with the Kuiper System. Licensed by the Commission on July 29, 2020, the Kuiper System will be comprised of 3,236 satellites at altitudes of 590 km, 610 km, and 630 km.² This grant would serve the public interest by enabling Amazon to further enhance and validate the components of the Kuiper System.

(3) Description of the operation to be conducted and its purpose.

¹ 47 C.F.R. §§ 5.51, 5.54(a)(2), 5.61.

² See *Kuiper Systems, LLC Application for Authority to Deploy and Operate a Ka-band Non-Geostationary Satellite Orbit System*, Order, 35 FCC Rcd 8324 (2020).

Amazon proposes to conduct testing of prototype antennas at indoor labs on Kuiper's campus, in Redmond, Washington. The test configurations will vary, but usually they will include the antenna under test and a standard commercial off-the-shelf antenna, which could be a horn or a probe.

The purpose of the tests will usually be calibration of the antenna under test, performance spot checking, bench testing of prototype RF circuits, or testing a link end-to-end. The power levels used for benchtop testing will be significantly lower than operational power levels. The proposed test activities all involve laboratory set-ups, consisting of a mix of commercially available and custom hardware typically laid out on lab benches. Hardware under test include:

- signal-generation circuit boards or equipment
- radio-frequency amplifiers, mixers, and filters
- antenna feeds

(4) Time and dates of proposed operation.

Amazon requests special temporary authority for a 180-day period and seeks to commence testing August 26, 2021.

(5) Class(es) of station (e.g., fixed, mobile, or both) and call sign of station (if applicable).

Fixed stations will be used; there are no call signs associated with any of the stations.

(6) Description of the location(s) and, if applicable, geographical coordinates of the proposed operation.

Amazon proposes to test the prototype equipment inside two Kuiper Laboratories located in Redmond, WA. The first location (Location 1) has skylights; the second location (Location 2) does not have any exterior windows. Coordinates for the two sites are as follows:

Site	Coordinates
Location 1	47°40'26"N 122°05'43"W
Location 2	47°40'22"N 122°05'39"W

Amazon recognizes that experimental operations must not cause harmful interference to authorized facilities, and, prior to commencing operations, Amazon will coordinate with any incumbent licensees as needed to ensure that Amazon's operations do not interfere with authorized operations. The operational characteristics of the testing (for example, its sporadic transmissions, its indoor location, the significant predicted signal attenuation due to the use of thermally efficient construction materials³) greatly reduce the likelihood that Amazon's operations will cause harmful interference to any licensees.⁴ However, should interference occur, Amazon will take immediate

³ See ITU Recommendation ITU-R P.2109-1.

⁴ The Commission's IBFS database indicates that the closest earth station that utilizes any of the frequencies requested in this STA application is 3.26 miles away.

steps to resolve the interference, including by discontinuing operations if necessary. In furtherance of this commitment, Amazon provides a stop buzzer point of contact in item (1), above.

(7) Equipment to be used, including name of manufacturer, model and number of units.

Amazon will test custom equipment, as well as standard antennas and transmitters:

Antennas:

Manufacturer	Model Number	Number of units
Eravant	SAC-2507-315-S2	2
Eravant	SAC-2507-470-S2	2
Amazon	N/A (Custom)	Variable, up to 2

Transmitters:

Manufacturer	Model Number	Number of units
Keysight	M9384B	1
NI	PXLe-5841	1
Amazon	N/A (Custom)	Variable, up to 6

(8) Frequency (or frequency bands) requested.

The requested frequency bands are summarized in the table directly below.

Frequency Band(s)
17.8 – 19.3 GHz
19.3 – 19.305 GHz
19.374 – 19.4 GHz
19.5 – 20 GHz
27.5 – 27.505 GHz
28.5 – 29.0 GHz
29.5 – 30 GHz

(9) Minimum and maximum effective radiated power (ERP) or equivalent isotropically radiated power (EIRP).

Frequency Band(s)	Minimum ERP (mW)	Minimum ERP (dBW)	Maximum ERP (W)	Maximum ERP (dBW)
17.8 – 19.3 GHz	1.0	-30.0	1.0	0.0
19.3 – 19.305 GHz	1.0	-30.0	1.0	0.0
19.374 – 19.4 GHz	1.0	-30.0	1.0	0.0
19.5 – 20 GHz	1.0	-30.0	1.0	0.0
27.5 – 27.505 GHz	1.0	-30.0	1.0	0.0
28.5 – 29.0 GHz	1.0	-30.0	1.0	0.0

29.5 – 30 GHz	1.0	-30.0	1.0	0.0
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(10) Emission designator or describe emission (bandwidth, modulation, etc.).

Frequency Band(s)	Emission Type/Designator	Frequency Stability
17.8 – 19.3 GHz	100MD7W	10 ppm
19.3 – 19.305 GHz	3M75D7W	10 ppm
19.374 – 19.4 GHz	1K00N0N	10 ppm
19.5 – 20 GHz	480MD7W	10 ppm
27.5 – 27.505 GHz	3M75D7W	10 ppm
28.5 – 29.0 GHz	15M9D7W	10 ppm
29.5 – 30 GHz	480MD7W	10 ppm

(11) Overall height of antenna structure above the ground.

All transmitting antennas will be operated indoors from laboratory bench tops situated on a ground-level floor. Consequently, these antennas will remain at or below 2.0 meters above ground-level.

(12) Width of the beam in degrees at the half power point.

A list of beam widths is provided in the table below. Kuiper Systems may also use custom antenna designs of varying directivity/beamwidth. All antennas will be operated in a manner that does not exceed the maximum ERP values provided in (9) above.

Antenna	Beam Width (degrees)
Eravant SAC-2507-315-S2	E-Plane: 9°; H-plane 10°
Eravant SAC-2507-470-S2	E-Plane: 8.5°; H-plane 10°
Custom	Variable

(13) Orientation in horizontal plane (degrees).

All antennas listed in this application may operate at any azimuth angle along the horizontal plane with respect to true North (0°-360°).

(14) Orientation in vertical plane (degrees).

All antennas listed in this application may operate at any elevation angle with respect to the horizontal plane (-90° to 90°).

(15) RF exposure compliance

The Commission’s rules for radiofrequency (RF) exposure “reflect the best available information concerning safe levels of RF exposure for workers and members of the general public” and

“specify methods that RF equipment operators can use to mitigate the risk of excess exposure.”⁵ Amazon will comply with these RF exposure guidelines with respect to the prototype antennas and test station transmissions, for uncontrolled (general population) and controlled (occupational) environments, as specified by Section 1.1310 of the Commission’s rules. The testing will occur indoors on private property, with restricted access only to authorized personnel. Hence, any transmissions will not occur in proximity to the general population. All Amazon personnel operating and maintaining the equipment will be trained on proper handling of the equipment to mitigate radiofrequency exposure. Furthermore, all transmissions will be positively controlled by Amazon personnel during testing who will be able to cease transmissions at any time.

⁵ *Proposed Changes in the Commission’s Rules Regarding Human Exposure to Radiofrequency Electromagnetic Fields*, 34 FCC Rcd 11687, paras. 2-3 (2019).